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XVI.—*Notes on some Genera and Species of Coccidæ.*
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1. *The Genus Dactylopius.*

ABOUT seven miles from the town of Wellington, in New Zealand, is a flat valley, about 10 miles long and perhaps 2 or 3 wide at the base, through which the lower part of the river Hutt flows into the head of Wellington Harbour. The land in this valley, which has been subject to innumerable overflows of the river, is very rich, and is mostly taken up by small farms or market gardens, and much fruit is grown there. During the summer of 1894-95 (September to March) the gooseberry-trees in these gardens and the grape-vines in the glasshouses were subject to a very annoying attack by an insect which was readily recognized as a "mealy-bug," but which had not previously appeared in such great numbers. After awhile the depredations of the insects became so bad and their numbers so large that quite a "scare" was produced, and the usual talk began of applying to the government for assistance. Many fruit-growers used remedies in the form of sprayed liquids, but seemingly without much success; and as I write the pest seems (from the accounts I have had) to be nearly as bad as ever.

Specimens of the insects were submitted to me for identification, and I was particularly asked to say whether the insects

on the gooseberries out of doors differed from those on the vines under glass. After careful examination I found that the two were essentially identical, and that they corresponded almost exactly with the species known in Europe as "*Dactylopius adonidum*," or the common mealy-bug. I say "almost exactly," because neither in them nor in any similar insects have I ever been able to detect one external character which is mentioned by Signoret ('Annales de la Soc. Entom. de France,' Dec. 23, 1874, p. 307) and also by Douglas ('Entom. Monthly Magazine,' vol. xxv. p. 314) in their descriptions of this species, viz. :—"Une bande brune sur le milieu du dos" (*Sign.*); "a broad brown or livid band-like shade" (*Dougl.*). During my study of Coccidæ, which extends now over twenty years, I have persistently endeavoured to minimize the importance of mere external colours and to lay stress upon anatomical characters only. But the occurrence of this insect in such suddenly injurious numbers, and its consequent importance, here led me to look into this question more closely in regard to the whole genus *Dactylopius*, and to try to tabulate, if possible, a principal character which might serve for ready differentiation in future.

I may say here that I am clearly of opinion that the insect in the Hutt Valley is not indigenous to New Zealand. All the European species of *Dactylopius* (so far as I know) exhibit on their lateral margins a number of white cottony tassels of varying length. In New Zealand I have described seven species believed to be indigenous, and none of them possesses this very distinct feature. Moreover, although the Hutt Valley was in former times very densely clothed with heavy forest, it is now almost entirely cleared. Further, the Coccids in question have appeared only in gardens and houses devoted to European plants.

The insects belonging to the genus *Dactylopius* may vary a good deal in their external appearance, and amongst the fifty or sixty which have been described some are aerial, some subterranean, some simply covered with thin meal, some having, in addition, cottony tassels, while others surround themselves with masses of cotton, and others form separate cottony sacs. Probably the best character by which to separate the species is one which requires by no means a difficult examination—I mean the relative lengths of the antennal joints in the adult female. This character may be very well made out without any long and tedious preparation of a specimen, and is therefore useful as a first guide to identification. I am not to be supposed to ignore other perhaps very distinct characters.

One of the reasons which led me to attach the Hutt Valley insects to *D. adonidum* was the exact correspondence of the adult female antenna with that of the European species; and for comparison I had the advantage of possessing not only the descriptions and figures of Signoret, Comstock, and Douglas, but also a mounted specimen of *D. adonidum* from Paris, which had been sent to me (unmounted, *in situ*) by Dr. Signoret himself. I am obliged here to draw attention to a rather curious error in Professor Comstock's description (Rep. of Entom. U.S. Dep. Agric. 1880). He there says:—"The antennæ are composed of eight joints, of which the eighth is the longest, and the third *and* the second, fourth and fifth the shortest and of equal length." This is meant to be translated from Signoret; but Signoret's words are "huit articles, dont le huitième le plus long, puis le troisième et le second, quatrième et cinquième d'égal longueur et les plus courts," which very clearly means that the third and second come next to the eighth and the fourth and fifth are the shortest and equal; and this is borne out by the actual specimens, as I show in the table below. The error is quite excusable, the original French being rather obscure; but it might lead to much confusion.

The following table will show the *formulæ* of the antennal joints in the species already described. For convenience I have grouped these species in the first place according to their external appearance, with or without cottony tassels, sacs, &c. The figures give the sequence of the joints, beginning with the longest, and those which are bracketed are intended to mean *equal* or *subequal*, the first in a bracket being perhaps longer than the others.

Genus DACTYLOPIUS.

Section I.—*Exhibiting dorsal meal and lateral cottony tassels.*

Species.	Author.	Locality.	♀ antennal formula.
<i>adonidum</i> (Linn.)	Signoret.	Europe.	8:321 (67) (54).
<i>affinis</i>	Maskell.	Australia.	8:3215 (746).
<i>alaterni</i>	Signoret.	Europe.	8:32 (4567) *.
<i>brevipes</i>	Cockerell.	West Indies.	(38)(12)(54)(67).
<i>bromeliæ</i> (Bouché)	Signoret.	Africa; India.	(238) 1 (4567).
<i>ceratonie</i>	Signoret.	Europe.	8:237456 *.
<i>citri</i> (Boisduval)	Signoret.	Europe.	(38) 2 (57) (46) *.
<i>Crawii</i>	Coquillett.	N. America.	(238) 5 (47) (61).
<i>cyperii</i>	Signoret.	Europe.	8 (32) (567) 4 *.
<i>destructor</i>	Comstock.	N. America.	83 (27) (56) 4 *.
<i>ephedre</i>	Coquillett.	N. America.	8 (23) 561 (47).
<i>ficus</i>	Signoret.	Europe.	83 (24567) *.

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Species.	Author.	Locality.	♀ antennal formula.
<i>hoyæ</i>	Signoret.	Europe.	?
<i>indicus</i>	Signoret.	Europe.	38 (2765) 4*.
<i>lavandulæ</i>	Signoret.	Europe.	38 (67) 2 (45)*.
<i>liliacearum</i> (Bouché) ..	Signoret.	Europe.	?
<i>lobulatus</i>	Maskell.	Australia.	823645 (71).
<i>longifilis</i>	Comstock.	N. America.	832 (15) 467.
<i>mamillariæ</i> (Bouché) ..	Signoret.	Europe.	8234 (567)*.
<i>nipæ</i>	Maskell.	Demerara.	8 (317) (246) 5.
<i>peridis</i>	Signoret.	Europe.	382 (4567)*.
<i>robinia</i>	Signoret.	Europe.	382 (576) 4*.
<i>Ryani</i>	Coquillett.	N. America.	(238) 1 (457) 6.
<i>solani</i>	Cockerell.	West Indies.	82 (31) 7 (56) 4.
<i>talini</i>	Green, MS.	Ceylon.	831257 (46).
<i>theobromæ</i>	Douglas.	S. America?	8 (32) 1 (576) 4.
<i>tuliparum</i> (Bouché) ..	Signoret.	Europe.	?
<i>viburni</i>	Signoret.	Europe.	(38) 2 (54) 67*.
<i>vitis</i> (Niedielski)	Signoret.	Europe.	3824567*.
<i>Walkeri</i>	Newstead.	Europe.	83 (1245) (67).

Section II.—*Without lateral cottony tassels; often with much cotton, but not forming separate sacs or cushions.*

<i>acaciæ</i>	Maskell.	Australia.	71 (24) (36) 5.
<i>arecæ</i>	Maskell.	New Zealand.	83 (21) 4567, or 73 (21) 4 (56).
<i>aurilanatus</i>	Maskell.	New Zealand.	38 (456721)
<i>calceolariæ</i>	Maskell.	New Zealand; Fiji; West Indies.	28153 (46) 7.
<i>cocotis</i>	Maskell.	Fiji; India.	8231 (4567), or 7 (231) 465.
<i>ericicola</i>	Maskell.	Australia.	7 (213) (65) 4.
<i>eucalypti</i>	Maskell.	Australia.	345 (216) 7.
<i>filamentosus</i>	Cockerell.	N. America.	7 (12) (34) (56).
<i>glaucus</i>	Maskell.	New Zealand.	831 (257) (46).
<i>iceryoides</i>	Maskell.	New Zealand.	812 (357) (46).
<i>mexicanus</i>	Cockerell.	Mexico.	384 (215) (67).
<i>poæ</i>	Maskell.	New Zealand.	8 (23) 1 (4567).
<i>simplex</i>	Cockerell.	West Indies.	(83) 217 (456).
<i>virgatus</i>	Cockerell.	West Indies.	(83) 214 (567).

Section III.—*Without cottony tassels; forming cushions of cotton.*

<i>albizziæ</i>	Maskell.	Australia.	81 (24) 3 (567), or 71 (24) 3 (56).
<i>herbicola</i>	Maskell.	Australia.	8 (12) (34) (56) 7, or 7 (12) (34) (56).
<i>hibbertiæ</i>	Maskell.	Australia.	8 (1234567).

Section IV.—*Without lateral cottony tassels; employing a plant-scale as a covering.*

<i>obtectus</i>	Maskell.	New Zealand.	8 (1234567).
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Section V.—Without lateral cottony tassels; forming separate cottony sacs.

Species.	Author.	Locality.	♀ antennal formula.
<i>alpinus</i>	Maskell.	New Zealand.	(8312) (456) 7.
<i>globosus</i>	Maskell.	Australia.	8 (231) 5 (467), or 7 (241) 356.
<i>graminis</i>	Maskell.	Natal.	8 (345) (721) 6.
<i>lobulatus</i>	Maskell.	Australia.	823645 (71).
<i>Steelii</i>	Cockerell.	N. America.	8 (12) 3 (4567).
<i>Townshendi</i>	Cockerell.	N. America.	7 (123) 465.
<i>vastator</i>	Maskell.	Sandwich Isl.	7 (21364) 5.

In the foregoing list *D. lobulatus* appears twice, for the reason that it exhibits the lateral tassels and also constructs a cottony sac.

In the insects marked * I find no mention of the first antennal joint. As a rule this joint is nearly equal to the second, but there are exceptions.

I incline to the belief that *D. hoyæ*, *D. liliacearum*, and *D. tuliparum* are only synonyms of *D. adonidum*.

Cockerell ('Entomologist,' 1893, p. 267) says that *D. destructor*, Comstock, "is now regarded as a synonym of *citri*." The antennal formulæ of the two, according to the foregoing list, indicates some difference.

In my 'Further Coccid Notes,' 1894, just published, I describe *D. vastator* from the Sandwich Islands, and mention that it approaches the Mexican species *D. Townshendi*, Cockerell. Here, again, the antennal formulæ indicate divergence, although in this case I think that probably it is not sufficiently marked to constitute by itself a *specific* character. But, taking it in conjunction with the differences noted by me in the feet, spinnerets, and marginal spines, I shall still for the present leave *D. vastator* separate.

D. theobromæ, Douglas, is placed by its antennæ very close indeed to *D. longifilis*, Comstock, and not far from *D. ficûs*, *D. pteridis*, and *D. brevipes*; and *D. talini* would also come into this group were it not for another character (long radiating glassy threads) which distinguishes it.

On the whole, whilst these "antennal formulæ" cannot be considered as decisive for the whole genus *Dactylopius*, I believe that they may be very fairly used to separate the species belonging to Section I.; indeed, they are probably the best guides for that section. As regards the other sections, they may be usefully considered in conjunction with other characters, and may often indicate near relationships; for example, in Section II. *D. simplex* and *D. virgatus* are

remarkably close to each other, with a variation only in the seventh joint, and as (from the descriptions given) there seems to be no other important differentiating character, these two will very likely be found to be identical, or, at most, varieties. In Section III. all the three species have nearly identical formulæ; but there is a marked difference between the cottony secretion of *D. herbicola* and those of the others, and *D. albizzie* also differs a good deal in the same particular from *D. hibbertie*. As for *D. obtectus*, whilst its formula is near to those of *D. alpinus* and *D. Steelii*, the employment by it of the plant-scales as a shelter is amply sufficient for separation.

2. The Genus *Planchonia*.

For several years past I have been endeavouring to establish the fact that all the forms which have been placed by various observers under the several names of *Pollinia*, *Asterolecanium*, *Lecaniodiaspis*, *Planchonia*, are really only variations or species of one genus; and I have affirmed that all these names, with the exception of *Planchonia*, ought to be abandoned. To that opinion I still adhere; and the more I am enabled to examine insects of this kind, the more I am convinced that my view is correct. In this place I may observe that, whilst hitherto I have not devoted much space to *Pollinia* and *Lecaniodiaspis*, these two are not really different from the others. It has been thought by some that *Pollinia* is characterized by the absence of a marginal fringe; yet it has precisely the same spinnerets as *Planchonia*, and, besides, the marginal fringe is by no means always conspicuous in any species; I have seen a twig covered with scores of insects, of which at least half exhibited no fringe at all, while the rest had a very fine one. *Lecaniodiaspis*, on the other hand, is said to differ from *Planchonia* by the presence of antennæ; but this, taken alone, and without any other distinguishing character to be made out, is surely an insufficient basis for the erection of a new genus, more especially as in *Planchonia* itself the antennæ are present, although in an atrophied or rudimentary form.

Consequently I stand by the sole genus *Planchonia* as far as this particular section of Coccidæ is concerned. Now in my paper (Trans. New Zealand Institute, 1894) I have divided this genus into three groups:—

1. Females having subcircular or elliptical tests;
2. Females having narrow elongated tests;
3. Females having irregular tests.

For the present I propose to consider only the first of these, leaving the others for future enquiry. This group may be said to include the following forms reported up to the present by various authors in different countries:—

1. *Planchonia* (*Pollinia*) *costæ*, Targioni.
2. — (*Asterolecanium*) *aurea*, Boisduval.
3. — (—) *quercicola*, Bouché.
4. — (—) *bambusæ*, Boisduval.
5. — *fimbriata*, Boyer de Fonscolombe.
6. — *arabidis*, Lichtenstein.
7. — *hederæ*, Lichtenstein.
8. — *epacridis*, Maskell.
9. — *stypheleæ*, Maskell.
10. — (*Lecaniodiaspis*) *sardoa*, Targioni.
11. — *oncidii*, Cockerell.
12. — *pustulans*, Cockerell.
13. — (*Lecaniodiaspis*) *yuccæ*, Riley.
14. — (*Asterolecanium*) *massalongiana*, Targioni.
15. — *ventruosa*, Maskell.

Three of the foregoing—*P. arabidis*, *P. hederæ*, and *P. yuccæ*—have never yet, so far as I am aware, been fully described, and cannot be included in our consideration on that account. I do not, however, think it probable that they will be found to depart in any important manner from the type.

I am not acquainted with *P. massalongiana*.

During the last summer (in February 1895) I received from Mr. R. J. Kingsley some twigs of oak trees thickly covered with thousands of insects, which I at once recognized as a species of *Planchonia*. I was informed that they are doing great damage to oaks near Nelson, in this colony, and I have heard subsequently that they have been noticed there for twelve or fourteen years. I found that these insects, both in their tests and in their anatomical characters, corresponded exactly with specimens which had been sent to me of *Planchonia quercicola*, Bouché, by Dr. Signoret about 1880. The occurrence of this species here in such numbers led me to look more closely still into the relationships of the genus *Planchonia*, and to cast about to find, if possible, some character which would be better adapted for proper discrimination than the mere outward appearance or colours of the test and the fringe. As regards the test, several writers have laid stress upon the differences which they have detected between "yellow" and "green" or "yellowish" and "greenish." I have found it many times very difficult to satisfy myself (although not in the least colour-blind) as to what specimens

have been "yellow" and what "green." The fringes, again, are sometimes white and sometimes pink; and authors have used these as separating characters. But I have found species in which the fringe varied in colour according to the bark of the twig they were on; so that this also is fallacious. Taking the insects themselves, it is also very difficult to detect differences. All of them are of a more or less sub-globular, elliptical, slightly tapering form. None of them exhibit any feet. All (with the exception of *P. sardoa*) have quite atrophied antennæ. All have precisely similar rostra and setæ. But it occurred to me that possibly some clue might be obtained from the arrangement of the peculiar figure-of-eight spinneret-orifices, pores, or glands (or whatever they are) which are common to all the species, but which do show, when closely examined, certain differences.

With this object I have studied with some care a number of prepared specimens, with the result that I find them as follows:—

One marginal row of S's; one row of simple orifices; no dorsal S's or tubes	<i>fimbriata.</i>
Do. Do. Do.	<i>quercicola.</i>
Do. Do. Do.	<i>pustulans.</i>
Do. Do. Do.	<i>epacridis.</i>
One marginal row of S's; one row of simple orifices (not numerous): many dorsal tubes	<i>stypheleæ.</i>
One marginal row of S's; one row of simple orifices; scattered S's on dorsum (not numerous)	<i>bambusæ.</i>
One marginal row of S's; one row of simple orifices; scattered S's on dorsum (numerous)	<i>oncidii.</i>
Two marginal rows of S's; scattered (numerous) simple orifices.	<i>ventruosa.</i>

According to this classification *epacridis*, *pustulans*, and *quercicola* would be varieties of *fimbriata*; *stypheleæ* would be close to them, but removed by the dorsal tubes which spring from simple orifices; *oncidii* would be a variety of *bambusæ*; and *ventruosa* would stand alone. As for *costæ*, *sardoa*, and *massalongiana*, I imagine that they will be found hereafter to be very close to *fimbriata*.

I fully acknowledge that there are many difficulties in the way of a satisfactory arrangement of this very peculiar genus; and I admit that the external appearance and colours of the tests do vary somewhat, *e. g.* as between *epacridis* and *quercicola* or *oncidii* and *bambusæ*. Yet it is, to me, undoubted that the real basis of all study of Coccidæ ought to be the study of the characters of the insects themselves, much more than that of their external coverings. I have already (in my paper of 1893, N. Z. Transactions, vol. xxvi.) observed how

easily one can mistake a Psyllid for a Coccid by considering only the waxy pupal test; and if it is so easy to make such a mistake between two different families, how much more so would it be to confuse two species of the same genus. There is little risk of such a thing if the characters of the insects themselves are made the principal points of separation.

3. *The Antennal Joints of Coccidæ.*

The study of Coccids differs from that of most other insects in that, as a rule, their extreme minuteness obliges us to adopt means of classification which are not necessary amongst the Lepidoptera, Coleoptera, &c. Moreover, in a large proportion of cases they not only are so covered by different kinds of secretion as to make it nearly impossible to judge from external marks or colours on the epidermis, but also usually shrivel up and become deformed at gestation, so that their very form is not a sure guide. Consequently, in order to arrive at anything like a clear classification, we have to use such characters as the number of antennal joints, the arrangement of certain hairs or processes, the form and proportions of the feet, and so on—things which, to a lepidopterist, for example, would seem absurd and useless.

In a very interesting paper by Herr Karel Sulc, published at Prague in 1894, on a new Coccid named by the author *Ortheziola Vejdovskyi*, it is stated that one of the characters separating this from the genus *Orthezia* is “the number of joints of the antennæ (in *Orthezia* 8–9, in *Ortheziola* 3 only),” and in the description of the insect Herr Sulc says: “the head is furnished with two frontal processes, to the apex of which are attached the antennæ.” In the excellent plate appended to the paper the antennæ and the “processes” are clearly shown (figs. 2 and 8).

I have ventured to draw the attention of Herr Sulc to the fact that in this description he is departing from the usual custom of students of the Coccidæ, which has hitherto been to consider what he terms the “frontal process” as the first joint of the antenna. I cannot affirm that the rule is absolute and universal, as there are exceptions; but it has been followed by such authorities as Signoret, Targioni, Comstock, &c., and, I think, by all the modern writers. Indeed, Herr Sulc, in the sentence quoted above, ascribes to the adult *Orthezia* “8–9 joints,” which cannot be, unless the “frontal process” is counted as one; and in a paper of his own, in the ‘Entomologist’s Monthly Magazine,’ February 1895, he

gives to *Lecanium Douglasi* the normal antenna of eight joints, including of course the "process."

Beyond the question of uniformity in dealing with Coccid classification, there remains of course the further one, whether the usual system is correct or not. In one sense it would not matter much which course might be followed: if we all agreed to ignore the "first joint," we should simply have to reduce by one the numbers given by authors hitherto. Yet I think there is a point which may be useful as indicating a real reason for the rule. In my paper of 1893 (Trans. N. Z. Institute, vol. xxvi. p. 86) I mentioned that in the Dactylopinæ and Acanthococcinæ the "anal tubercles" seem usually to be more chitinous than the rest of the abdominal epidermis, and that in nearly all Coccids the antennæ, feet, and rostrum present the same character. Since seeing Herr Sulc's paper I have examined a large number of specimens of many genera, mounted after preparation with potash, and find that whilst there is, almost without exception, a clear difference noticeable between the antenna and the epidermis of the head, that difference is as clear in the first joint as it is in the others. A difference indeed, such as I refer to, may be seen in fig. 2 of Herr Sulc's plate of *Ortheziola*. This being so, I cannot help thinking that a feature which pervades the whole Coccid family may be accepted as showing that the so-called "frontal process" is a part of the antenna rather than a part of the head. In fact, as we do not consider the coxa of the foot as only a "lateral process" of the thorax, but as really the first joint of the foot, it seems that we ought also rightly to speak of the first joint of the antenna as springing direct from the head. According to this view, *Ortheziola Vejdovskyi* will have antennæ of *four* joints.

It may be admitted that the question here raised is quite open to discussion; and some entomologists may possibly deem it unimportant, though it has some importance in the study of Coccids, which, as remarked just now, must proceed on somewhat different lines from that of other insects.

Wellington, New Zealand,
May 1895.